DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA 91125

Fads, Upward Sloping Demand and the Stability of Equilibria in an Experimental Market

Charles R. Plott

Jared Smith

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Abstract

The objective of the paper is to study markets in which the value of the activity to any one person increases with the level with which the activity is undertaken by others. The general interpretation could be fads, mimicking behavior or some sort of belief formation process in which the beliefs or expectations of agents about some underlying state of nature are influenced by the buying behavior of other agents. The result is to create a market that can be modeled as having an upward sloping market demand curve. The questions posed are: (1) in the fad-like environment does the classical concept of equilibrium (as an equating of market demand and market supply) accurately predict market behavior; (2) can both stable and unstable equilibria be observed; and (3) which of the two classical concepts of stability best describes the conditions under with instability is observed?

The results of the paper confirm some of the major findings of Plott and George who studied a similar environment with a downward sloping supply. In a market organized by the multiple unit double auction (MUDA), the equilibration at a demand equals supply equilibrium is observed under the conditions of a fad. Disequilibrium follows the dynamics of the Marshallian model as opposed to the Walrasian model.

Fads, Upward Sloping Demand and the Stability of Equilibria in an Experimental Market

Charles R. Plott Jared Smith [1]

This paper reflects two objectives. The first is to study markets in which fad-like motivations exist. From among the various types of phenomena that could be called fads, the focus of the analysis here is restricted to the case in which the value of the activity to any one person increases with the level with which the activity is undertaken by others. The more others do it the more any particular individual wants to do it. The general interpretation could be preferences that result in mimicking behavior or it could be some sort of belief formation process in which the beliefs or expectations of agents about some underlying state of nature, are influenced by the buying behavior of other agents. The result is to create a market that can be modeled as having an upward sloping demand. The upward sloping demand provides an opportunity to study the dynamics of market equilibration because both stable and unstable equilibria might be observed. From the perspective of the first objective, the questions to be posed are: (1) in the fad-like environment does the classical concept of equilibrium (as an equating of market demand and market supply) accurately predict market behavior; (2) can both stable and unstable equilibria be observed; and (3) which of the two classical concepts of stability best describes the conditions under which instability is observed?

The second objective is to replicate and extend results of Plott and George (1992) who initiated an experimental investigation of market stability. They studied markets in which the supply was downward sloping due to a Marshallian type externality and found that the Marshallian model of market stability provided the appropriate conditions under which instability would be observed. The Walrasian concept of stability was found to be completely inappropriate for that type of economic environment. Since a fad is mirror image of a Marshallian externality, the current study is a test of both the replicability and robustness of the Plott and George experimental results. The question posed from this second perspective is whether the Marshallian concept of stability or the Walrasian concept correctly identifies the conditions under which instability will be observed when the environments include a faddish component.

The paper is organized as follows. The first section provides a brief review of the models and experimental design. Included in this section is a discussion of a special treatment variable. A possibility exists that market activity will equilibrate at an unstable equilibrium and if this happens some method of "perturbing" the market away from the equilibrium is necessary. The special treatment is a technique for moving an initially

[1]The support of the National Science Foundation and the Laboratory for Experimental Economics and Political Science is gratefully acknowledged. Special thanks are given to the members of the Caltech workshop in experimental methods. Jared Smith was a Caltech undergraduate student who was enrolled in that class.

equilibrated market into a region in which the dynamics that produce instability might be observed. The second section is a brief statement of the underlying theory of markets. The third section discusses the specific parameters, outlines the procedures and the details of parameters. In addition, a subsection is included that shows the relationship between the parameters used by Plott and George and the parameters implemented here. The fourth section deals with the details of experimental procedures and design. The fifth section is a review of results and conclusions. The final section is a summary.

The results of the paper confirm some of the major findings of Plott and George. In a market organized by the multiple unit double auction (MUDA), the equilibration at a demand equals supply equilibrium is observed under the conditions of a fad. Disequilibrium follows the dynamics of the Marshallian model as opposed to the Walrasian model.

1. Models and Design

A continuous approximation of the upward sloping demand function, D_1D_1, used to model the behavior is shown in Figure 1. The exact nature of the induced preferences which suggest this model is outlined in the next section. The experiments begin with parameters that generate the supply curve S_1S_1.

Under S_1S_1 the Marshallian stable[2] equilibria are the points {b, d}. Point {c} is a Marshallian unstable equilibrium but it is a Walrasian stable equilibrium. On the interior of the space, where demand is upward sloping, equilibria that are Marshallian stable are Walrasian unstable and Walrasian stable equilibria are Marshallian unstable. It is this inverse relationship that motivates the experimental design . The exception is on the boundaries. For example, point {a} is a Walrasian stable equilibrium but it is not a Marshallian equilibrium.

By beginning with S_1S_1 parameters it is possible to discover whether or not the system moves toward one of the Marshallian stable equilibria or one of the Walrasian stable elquilibria. Based on the report of Plott and George the expected movement is toward the Marshallian stable equilibria even though they are Walrasian unstable. After equilibration has been given an opportunity to occur, the supply curve is shifted to S_2S_2. This shift is such that important (interior) Marshallian stable equilibria before the shift are changed to Marshallian unstable equilibria. This parameter change creates the conditions under which, according to the Marshallian model, the activity will move away from the equilibrium if slightly perturbed. Of course, the Walrasian model predicts the

[2]The Marshallian model of market dynamics is $\partial Q/\partial t = f(P_D(Q) - P_S(Q))$ where Q = quantity and $P_D(Q)$ and $P_S(Q)$ are respectively the demand price and the supply price at the quantity, Q. The Walrasian model of market adjustment is $\partial P/\partial t = Q(D(P) - S(P))$ where P is the market price and D(P) and S(P) are respectively the quantity demanded and the quantity supplied at the price P.

Figure 1: Demand (D_1D_1) and Two Supply Curves S_1S_1 and S_2S_2.

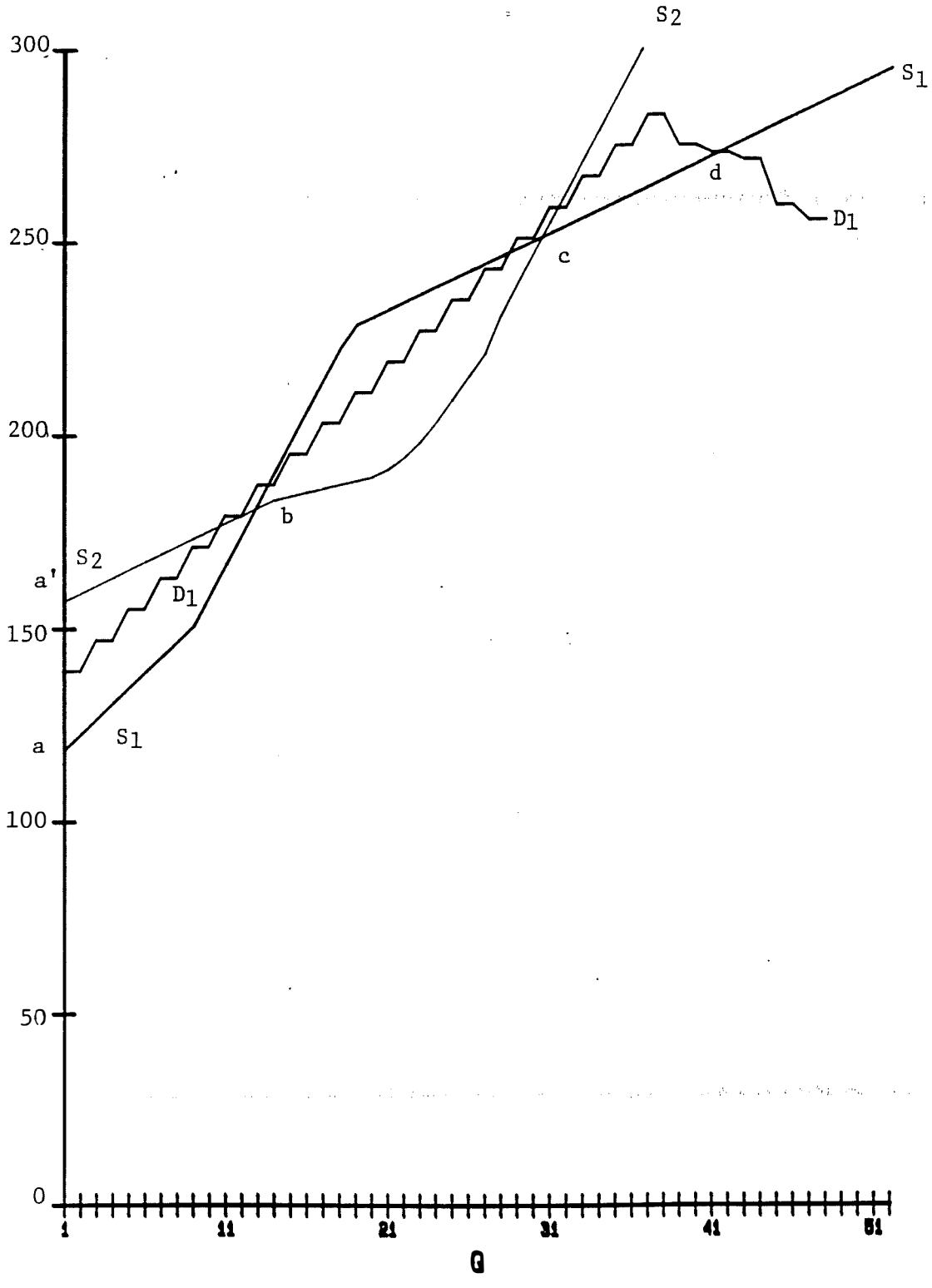
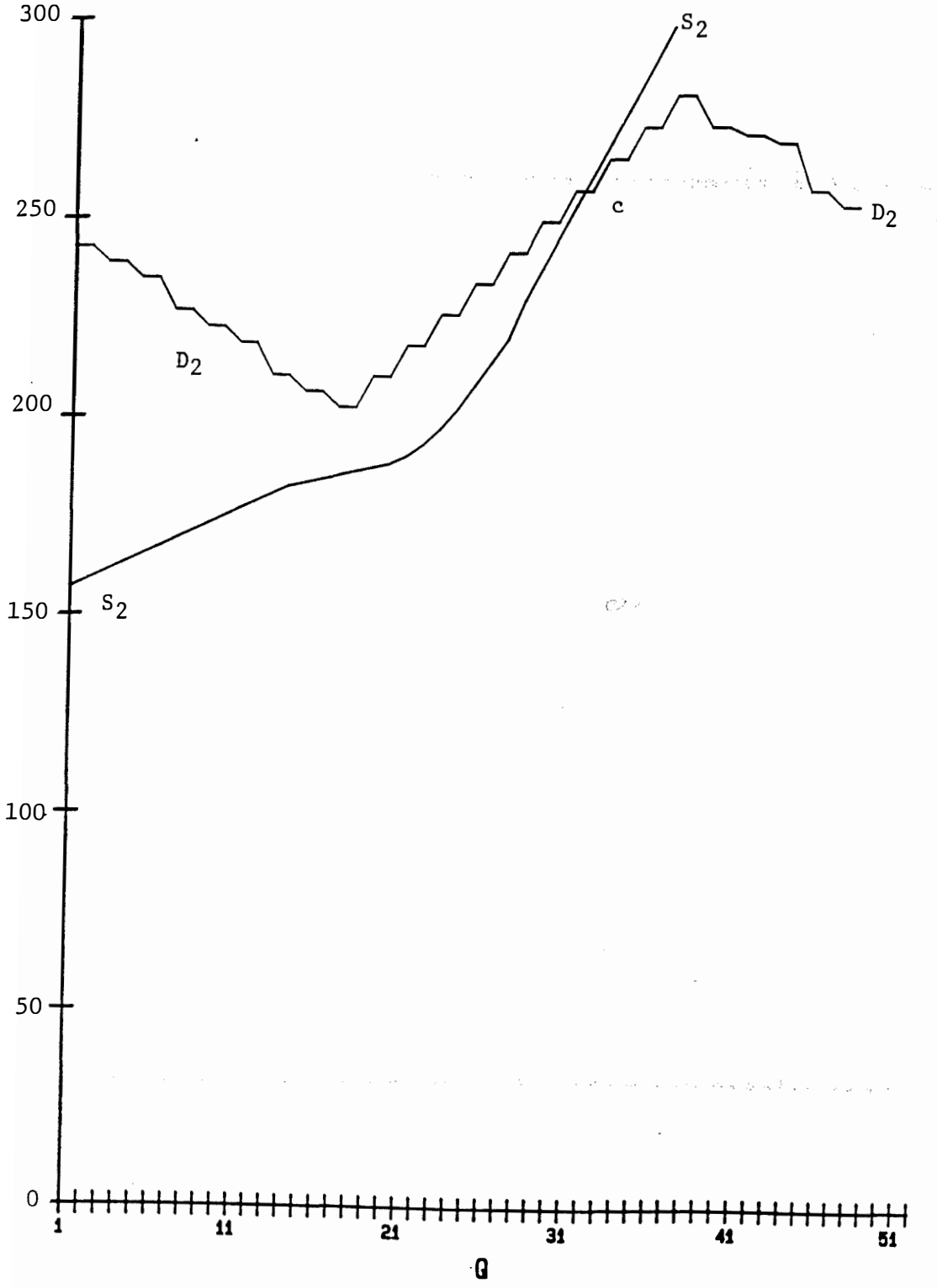


Figure 2: Demand (D_2D_2) with Minimum Guarantee and Supply S_2S_2.



activity should stay where it is since the condition for stability would exist according to the Walrasian model.

The possibility exists that market activity could stay positioned at an unstable equilibrium. The dynamic model requires a "small" perturbation in order to initiate the movement away from the unstable point. Of course, we have no empirical foundation for knowing what a "small" change is. The experimental design we chose called for a rather dramatic "push" to the market to see if the dynamics, once initiated, continued to be Marshallian as opposed to Walrasian.

All previous experience suggested that the market would first equilibrate at point {b}. If the shift to S_2S_2 did not produce a change in the market after a few periods it was presumed that the market could stay there for a long time, possibly to the end of the experiment. It was felt that more interesting data would be produced by a "push."

The push was in the form of a guaranty to all buyers, that the volume of others would be at least 15 units. This means that each demander would have a "normal" demand curve until market volume got high enough (beyond previous equilibrium point {b}) and then the Marshallian externality would take over. The new demand curve would become D_2D_2 in Figure 2. Notice that if the market is at point {b} the demand shift should push the activity to the right where the Marshallian dynamics would ultimately take it to point {c}. There is no stable Walrasian equilibrium in the vicinity where the guarantee ends, but the Walrasian dynamics are still the opposite of the Marshallian and point {c} is an unstable Walrasian equilibrium.

2. Underlying Theory

The upward sloping demand curve is the result of an externality. In the environments under consideration each individual buyer agent makes decisions based on attitudes that depend upon own consumption and the consumption of others. These attitudes are captured by a utility function of the form $U(x_i, x_{-i})$ where x_i is own consumption and x_{-i} is the consumption of others. In the modeling effort a distinction is made between x_{-i} and x_{-i}^e where x_{-i}^e is the beliefs that i has about the consumption activities of other agents.

In a competitive model each individual attempts to maximize $U(x_i, x_{-i}^e)$ subject to the budget constraint. The equilibrium of the system requires that given expectations and given prices, the individual is maximizing. In addition, the rational expectations requirement is added: each individual's expectation of the consumption of others is equal to the actual consumption of others. That is, in equilibrium, $x_{-i}^e = x_{-i} = \sum_{j \neq i} x_j$.

3. Parameters

Table 1 contains the values of the market demand models and the market supply models used in all experiments. These models all direct reflections of the individual incentives. The most complicated aspect of individual incentives is the determination of redemption values for buyers because they are critical for fad-like behavior. The concept of a fad is

TABLE 1

INDUCED MARKET DEMANDS AND MARKET SUPPLIES

Quantity	$D_1(Q)$	$S_1(Q)$	$S_2(Q)$	$D_2(Q)$ [with guarantee]
1	139	119	157	243
2	139	123	159	243
3	147	127	161	239
4	147	131	163	239
5	155	135	165	235
6	155	139	167	235
7	163	143	169	227
8	163	147	171	227
9	171	151	173	223
10	171	159	175	223
11	179	167	177	219
12	179	175	179	219
13	187	183	181	211
14	187	191	183	211
15	195	199	184	207
16	195	207	185	207
17	203	215	186	203
18	203	223	187	203
19	211	229	188	211
20	211	231	189	211
21	219	233	191	219
22	219	235	194	219
23	227	237	198	227
24	227	239	203	227
25	235	241	209	235
26	235	243	215	235
27	243	245	221	243
28	243	247	231	243
29	251	249	239	251
30	251	251	247	251
31	259	253	255	259
32	259	255	263	259
33	267	257	271	267
34	267	259	279	267
35	275	261	287	275
36	275	263	295	275
37	283	265	303	283
38	283	267	311	283
39	275	269	319	275
40	275	271	327	275
41	273	273	335	273
42	273	275	343	273
43	271	277	351	271
44	271	279	359	271
45	259	281	367	259
46	259	283	375	259
47	255	285	383	255
48	255	287	391	255
49	0	289	399	0
50	0	291	407	0

captured by the dependence of each individual buyer's preference function on the volume purchased by others. As any one agent buys more, the value of additional units to other agents increases. The models of the situation assume that agents prefer more money to less and have no preferences over the activities in the experiment other than those that create money income. That is, where m_i is the amount of money earned by the subject in a given period of the experiment, the incentives on which the model is based are captured by the function $U^i(m_i)$ where $U^i(.)$ is any utility function that is monotone in money. If the individual faces a competitive market price P then the money income of agent i is of the form

(1) $\quad m_i = R^i(x_i, x_{-i}) - P x_i$ where

the function $R^i(x_i, x_{-i})$ is the redemption value that the buyer receives from the experimenter; x_i is the number of units purchased by i ; x_{-i} is the number of units purchased by all other agents; and, P is the price paid by the buyer for each of the x_i units. The specific functional form of the redemption value function is:

(2) $\quad R^i(x_i, x_{-i}) = a_i x_i - b_i x_i^2/2 + c_i x_i x_{-i}$

where a, b and c are constants that are determined by the experimenter.

Since all buyers and sellers were in essence given interest free loans for the duration of a period, the maximization hypothesis dictates that the buyers will behave as if they were attempting to satisfy the equation $\partial U(m_i(x_i,x_{-i}))/\partial x_i = 0$. From (1) this equation becomes

(3) $\quad \partial U^i(m_i(x_i, x_{-i}))/\partial x_i = a_i - b_i x_i + c_i x_{-i} - P = 0$, or using (2) it becomes

(4) $\quad \partial R^i(x_i,x_{-i})/\partial x_i = a_i - b_i x_i + c_i x_{-i} = P.$

Equation (4) is the basis of the incentive charts for buyers contained in appendix tables A1, A2, and A3. The experiment employed three different agent buyer types and there were two subjects of each type. The tables give the marginal redemption values, $\partial R(x_i, x_{-i})/\partial x_i$,which depend upon the agent's type. All buyer agents had identical parameters b and c with b=16 and c=8 . Agent buyers differed in the a_i parameter according to type with the value of $a \in \{132, 136, 140\}$ depending upon type. The units of m are in francs. The franc values were converted into U.S. dollars at a rate of .024 dollars per franc for buyers and .01 dollars per franc for sellers.

The values of the market demand model in Table 1 are derived by an application of the theory elaborated above and the data in the appendix tables. The reader will notice that the tables are not well approximated by the function $a_i - b_i x_i + c_i x_{-i}$, because the table contains "jumps" in the values from time to time (every 5th column). This discrepancy is

due to a the way that rounding was dealt with in the original Plott and George parameters. The parameters in the tables are a direct translation of the Plott and George parameters from sellers to buyers. For theoretical purposes the continuous model represented in equation (4) should be adequate.

The parameters for sellers are contained in Table 1 for each of the two supply functions. As can be seen these are well represented by the curves in Figure 1. The curve S_1S_1 was operative for the first 8 periods and at period nine the curve shifted to S_2S_2. The shift was unknown to the buyers whose incentive sheets remained the same throughout the experiment.

The equilibria under the various conditions are listed in Table 2. As can be seen, with the exception of the outer most equilibrium under conditions S_1S_1, all equilibria have opposing stability properties depending upon the theory applied. And, after the supply shift the properties are revised.

4. Experimental procedures

A total of three experiments were conducted plus pilot experiments. These are indexed by the dates on which the experiments were conducted (021592, 022292, and 030292). Subjects were students at the California Institute of Technology who were recruited for the experiment and were told that they would be paid. The instructions in Appendix B were read to the subjects. Afterward the markets were opened through a computerized market in the Caltech Laboratory for Experimental Economics and Political Science. All markets were organized as computerized multiple unit double auctions (MUDA) as described in Plott (1991). Subjects were trained to use the computer in electronic markets through the software tutorial programs contained in the general MUDA package. The incentive charts were organized such that it is reasonable to assume that the fact that the market demand function was stationary over all periods was public information. The incentives charts of suppliers was such that the existence of a supply curve shift could not have been detected by the demand side of the market until it was revealed through the behavior of the market itself.

Two of the experiments (022292) and (030292) were conducted according to plan but a serious mistake was made by one of the suppliers in the third experiment (021592), which effectively ruined the data for purpose of comparison with the other two experiments. The data from the third experiment are included and analyzed separately in the overall analysis because this poorly executed experiment does reveal an interesting phenomenon which is discussed independently. While only two good experiments might seem to be insufficient, reflection on the problem does not seem to provide a good reason to spend the time and money necessary to conduct more. The dynamic results are strong and it is not clear exactly what variables will be controlled by additional observations. In brief, without a clear idea of what could be learned from additional experiments, the decision was made to stop with two experiments.

TABLE 2

EQUILIBRIA (P,Q), AND STABILITY PROPERTIES: WALRASIAN (W), MARSHALLIAN (M), STABLE (S) AND UNSTABLE (U)

Supply Conditions

S_1S_1			S_2S_2			S_2S_2 with Demand Guaranteed Volume		
Point on Fig.1	P, Q		Point on Fig.1	P, Q		Point on Fig.1	P, Q	
a	119,0	WS	a'	154,0	MS			
b	176,12	WU,MS	b	176,12	WS,MU			
c	248,30	WS,MU	c	248,30	WU,MS	c	248,30	WU,MS
d	273,40	WS,MS						

All experiments were conducted under the same format of parameters and parameter changes. The first nine periods (period 0 thru 8) were conducted under supply conditions S_1S_1. A shift in supply to S_2S_2 occurred before the opening of period nine (which was really the 10th period) and remained in place until the end of the experiment. In summary the experimental conditions were as follows:

> experiment 021592: periods 0 thru 8 supply S_1S_1 was operative and periods 6 and 7 were skipped: periods 9 thru 19 supply S_2S_2 was operative.
>
> experiment 022292: periods 0 thru 8 supply S_1S_1 was operative; periods 9 thru 19 supply S_2S_2 was operative; a guarantee of the volume of other at 15 units was implemented at the start of period 15.
>
> experiment 030292: periods 0 thru 8 supply S_1S_1 was operative; periods 9 thru 19 supply S_2S_2 was operative.

The different period structure of experiment 021592 reflected the problem with experimental control. A seller thought that selling all units listed on the incentive sheet was necessary. Theoretically, this would be interpreted as a substantial shift to the right of S_1S_1 which moves all interior equilibria to the right. Of course, during the first periods the high volume (e.g., 40 units) was noticed by the experimenters. However, the possibility that a subject might be confused was not really considered by the experimenters at first. Instead the experimenters thought that the market had found the stable equilibrium that exists at the point (40,273). This particular equilibrium is very costly to the experimenters and a decision was made to save money and eliminate periods 6 and 7. If the market was resting at that equilibrium little was to be learned by letting it continue there the entire planned period. The subjects were told that due to a computer problem, periods 6 and 7 would be opened and then immediately closed without trade and that the subjects should simply mark out those periods on the incentive charts. They were told that the experiment would resume at period 8. Period 8 was chosen because it is one period before the parameter shift to the S_2S_2 supply curve. While periods 6 and 7 were being opened and closed a spot check of subject records revealed the confused subject. Thus, before the beginning of period 8 the confusion was discovered and the subject was told that it was not necessary to sell everything. After this the experiment proceeded as planned. Of course, all subjects had learned from the market in the first several periods that the market could sustain a high volume. In particular the buyers , who did not know of the supply shift, were aware of the possibility.

5. Results

The time series from all three experiments are displayed in Figures 3, 4 and 5. Shown on the horizontal axis is time in seconds. The vertical axis is price. The circles represent contracts. The vertical lines are the end of periods. The horizontal lines are most

important equilibria. The bottom of the figures contain average prices per period and volumes.

The central conclusion is that Marshallian stability as opposed to Walrasian, is the appropriate model for environments like the one under study is supported by the visual representation of the data. The time series from the two central experiments (022292 and 030292) are contained in Figures 4 and 5.

In both experiments under S_1S_1 the time series reveals the convergence to the nearest stable Marshallian equilibrium point at (176,12). This equilibrium is Walrasian unstable but it is Marshallian stable. The supply shift S_2S_2that occurs in both periods nine of both experiments is accompanied by a movement way from the old equilibrium (which is now Walrasian stable) toward one of the two neighboring stable Marshallian (unstable Walrasain) equilibria. In Experiment 022292, the convergence downward toward point {a'} at (154,0) and in 030292 the convergence is upward toward point {c} at (248,30). The following are clear statements of the results.

RESULT 1. THE LAW OF SUPPLY AND DEMAND ACCURATELY PREDICTS POINTS OF EQUILIBRATION.

SUPPORT. In both of the central experiments , after a period of time after a parameter shift , the data are close to one of the equilibria of the demand and supply model. In experiments 022292 and 030292 under conditions S_1S_1, by periods 7 and 8 the average prices in both experiments are within 3 francs of the equilibrium at point (176, 12) and the volume is within two units. In particular the data for experiment 022292 and for the two periods are respectively (179, 12) and (176, 10) and for experiment 030292 are (175, 14) and (176, 13) as shown in Figures 4 and 5.

After the supply shift to S_2S_2, the data are again near an equilibrium after a few periods. In particular by period 13 and 14 the average price and volume of (167, 3) and (. , 0) are near the equilibrium (154 , 0) in experiment 022292. After periods 16 and 17 in experiment 030292 the average price and quantity of (247,30) and (246, 29) are near the equilibrium (248,30). The final periods of experiments 021592 and 022292 are not so close but as the dynamics model will show the movement is toward an equilibrium in these periods as well.•

RESULT 2. PRICE AND QUANTITY MOVEMENTS ARE IN THE DIRECTION PREDICTED BY THE MARSHALLIAN MODEL AND NOT IN THE DIRECTION PREDICTED BY THE WALRASIAN MODEL.

SUPPORT. Table 3 contains the estimates of the dynamic equation predicted by the two models. As can be seen for the two central experiments 022292 and 030292 , the estimates of the slope coefficients of the Marshallian model are positive as the theory assumes, and significant. The slopes are 0.17 and 0.24 respectively. The intercept should be zero according to the model but as can be seen the intercept is significantly different

TABLE 3

ESTIMATED
(t Statistics)

Marshallian Model $dQ/dt = a + b\,[P_D(Q) - P_S(Q)]$	Walrasian Model $dP/dt = a + b\,[D(p) - S(p)]$

	a	b	R^2	dw	a	b	R^2	dw	N
21592	- 1.04 - (0.316)	-0.27 - (0.93)	0.10	1.12	- 0.75 - .085	0.67 0.36	.01	0.75	10
022292	- 1.26 (- 2.29)	0.17 (2.85)	0.35	2.62	- 2.53 - 1.74	- 1.86 - 3.38	.43	3.03	17
030292	- 0.93 - 0.85	0.24 2.65	.31	1.74	- 6.03 - 3.09	- 4.35 - 6.14	.71	1.60	17

from zero in experiment 022292. This non-zero intercept is the only evidence that would lead to the rejection of the Marshallian model. On the other hand, the estimates of the slope coefficients of the Walrasian model are of the wrong sign and significant in both experiments. In addition, the Walrasian model also has the problem with the significant non-zero intercept term. In summary the econometric model of the dynamics measures the movement in these markets as going in the direction predicted by the Marshallian model and going in the direction opposite to that predicted by the Walrasian model. The model detects no movement in the experiment 021592 in which experimental control was lost.•

OBSERVATION. THE DYNAMICS OF PRICE ADJUSTMENT HAVE A MEMORY. INFORMATION IN THE ADJUSTMENT PROCESS IS NOT SIMPLY LOCAL INFORMATION OF THE RECENT PAST.

SUPPORT. The support for this observation comes from Experiment 021592 in which experimental control was lost. Notice in Figure 3 that the data start with high prices and volume due to the confusion of the one supplier. It is interesting to note that during period 8 the market is resting at an unstable Marshallian equilibrium. When the shift occurs at period 9 the equilibrium becomes Marshallian stable and during period 9 the market stays near the equilibrium. However in order to get to the high priced equilibrium the market must move away from the Stable Marshallian of zero volume that exists at point {a'} on the boundary. While the fall in prices and volume that occur in periods 10 , 11 and 12 represent general movements toward this Marshallian stable boundary equilibrium between periods; the fact that any volume exists at all during a period is in defiance of the dynamical pressures of the Marshallian model. The small volumes that occurred in periods local 13 an 14 when the market price falls to the lowest levels, are due to the buying behavior of a single agent. The actions of one buyer constitutes 100% of the volume in periods 12, 13 and 14. It is natural to assume that this buyer is trying to signal other buyers to get the volume up so the market volume would be like the profitable experiences during the first periods of the experiment at volume of 30 units. The hint is then picked up by other buyers in period 15. The volume and price move through the stable Walrasian (Marshallian unstable) equilibrium at (176,12) and continue to converge to the high level Marshallian stable equilibrium near (248,30).•

6. CLOSING REMARKS

The properties of equilibration known to exist in the downward sloping supply case of a Marshallian externality appear to exist with equal strength in the upward sloping demand case of a fad. In these environments the law of supply and demand appears to work to predict equilibrating tendencies. This is not an obvious event since a substantial rational expectations component exists in the construction of the demand side of the market model. Classical concepts of market stability and instability are observed. The conditions under which instability is observed are predicted by the Marshallian model of

market adjustment and not the Walrasian model. In brief, the major results reported by Plott and George have been replicated and extended to a broader, but theoretically similar, economic environment. The major outstanding issue is whether or not the results extend themselves to the backward bending case.

Figure 3: Contract Time Series Experiment 021592

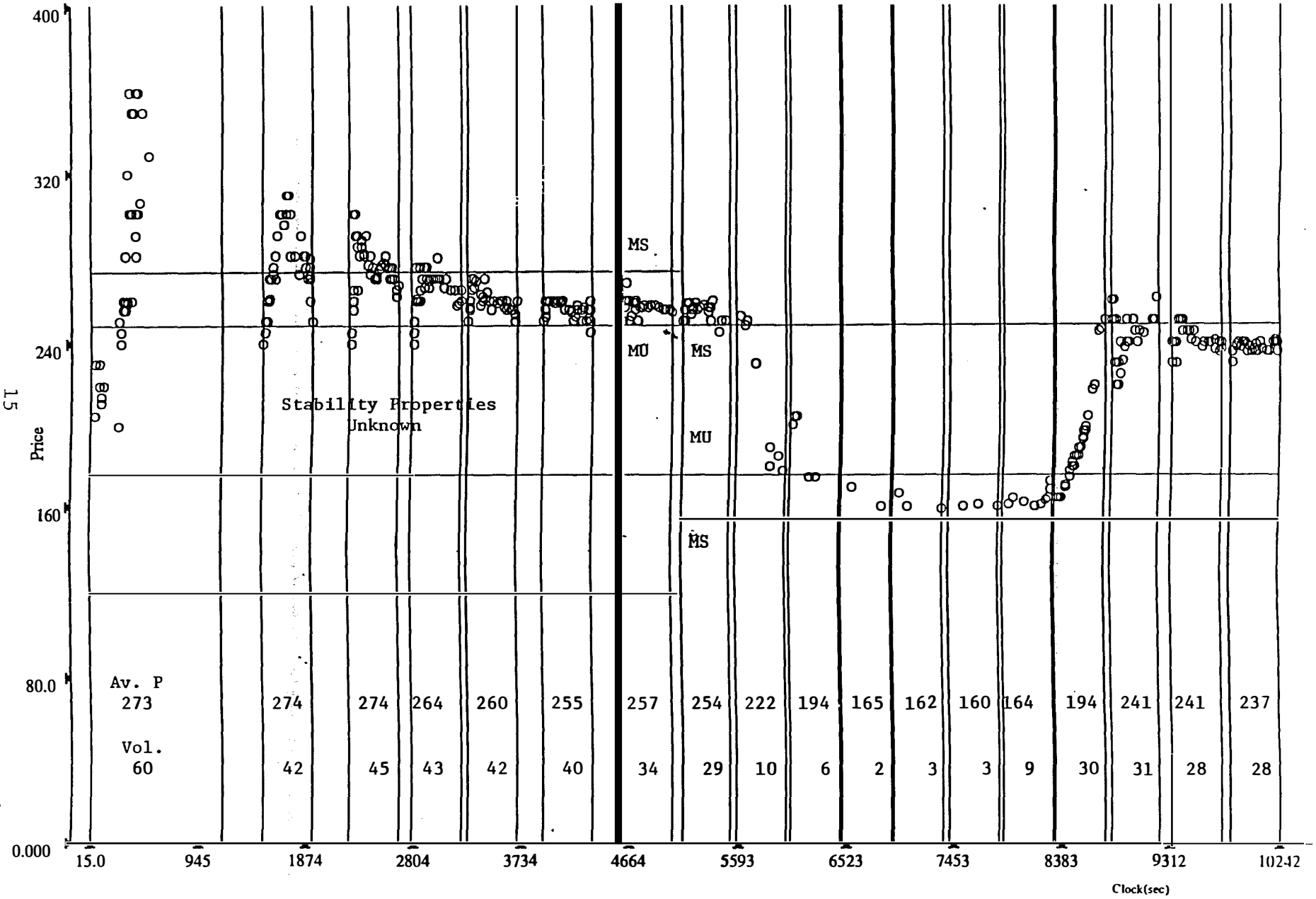


Figure 4: Contract Time Series Experiment 022292

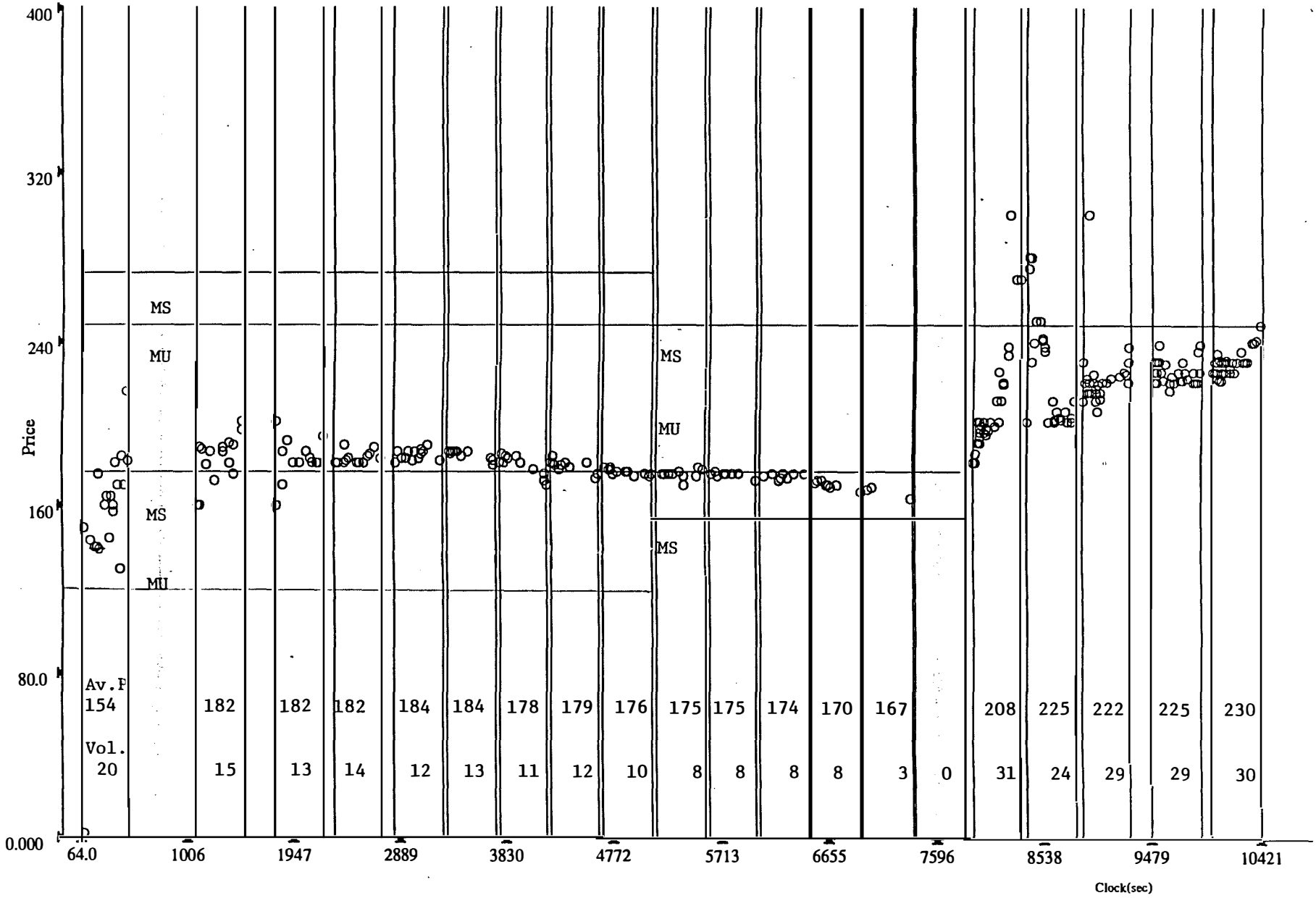
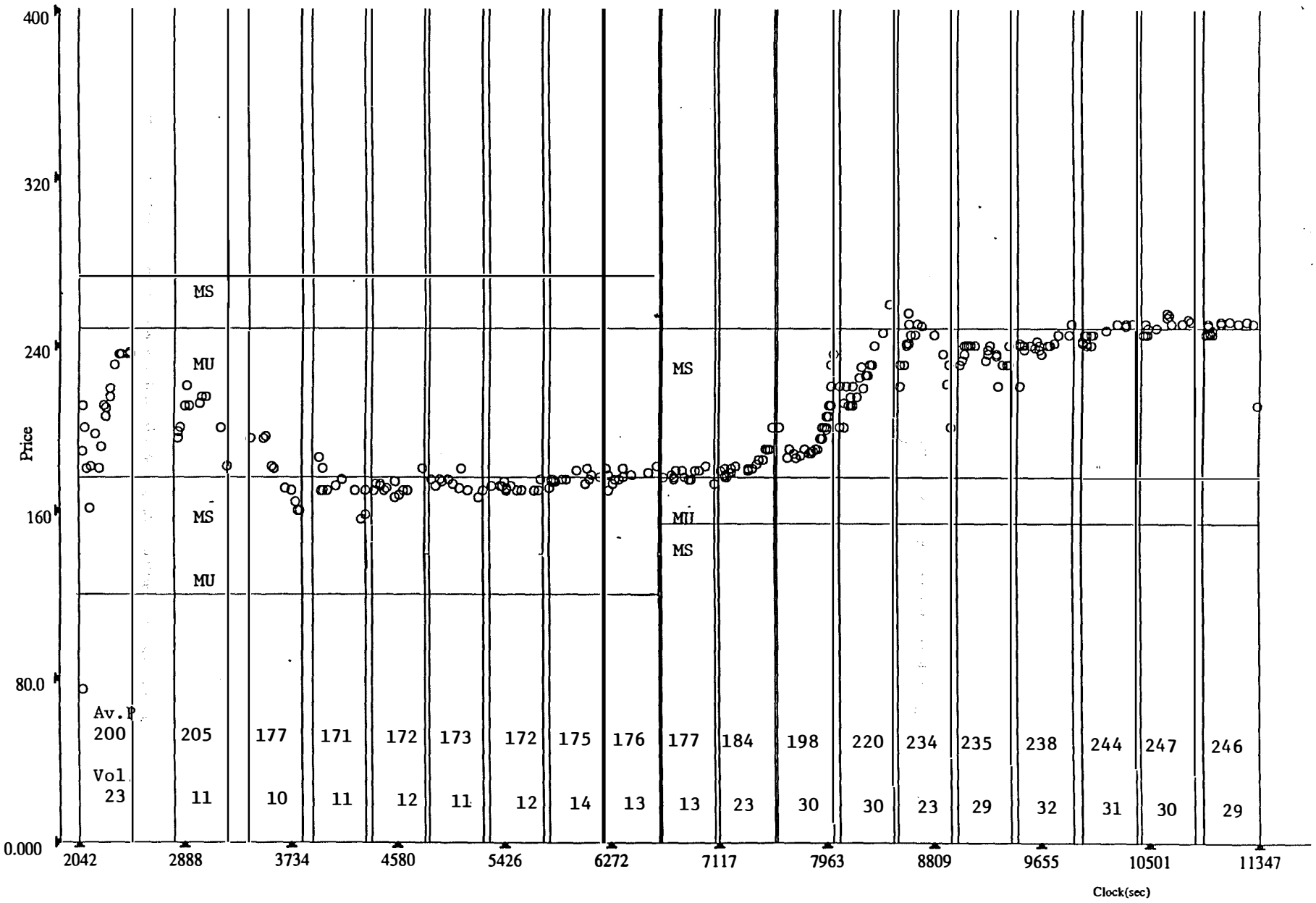


Figure 5: Contract Time Series Experiment 030292



APPENDIX A

Seller Incentive Sheets

Redemption Sheet

Buyer #__O__

	Volume of Others																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1st unit	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306	312	318	324	340	346	352	358	364	380	386
2st unit	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290	296	302	308	324	330	336	342	348	364	370
3st unit	92	108	114	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292	308	314	320	326	332	348	354
4st unit	76	92	98	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276	292	298	304	310	316	332	338
5st unit	60	76	82	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288	294	300	316	322
6st unit	44	60	66	72	78	84	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306
7st unit	28	44	50	56	62	68	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290
8st unit	12	28	34	40	46	52	68	74	80	86	92	108	114	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274

Redemption Sheet

Buyer # 3

	Volume of Others																															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1st unit	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292	308	314	320	326	332	348	354	360	366	372
2st unit	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276	292	298	304	310	316	332	338	344	350	356
3st unit	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288	294	300	316	322	328	334	340
4st unit	72	78	84	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306	312	318	324
5st unit	56	62	68	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290	296	302	308
6st unit	40	46	52	68	74	80	86	92	108	114	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292
7st unit	24	30	36	52	58	64	70	76	92	98	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276
8st unit	8	14	20	36	42	48	54	60	76	82	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260

Redemption Sheet

Buyer #____1____

	Volume of Others																														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1st unit	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288	294	300	316	322	328	334	340	356	362	368
2st unit	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306	312	318	324	340	346	352
3st unit	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290	296	302	308	324	330	336
4st unit	68	74	80	86	92	108	114	120	126	132	148	154	160	168	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292	308	314	320
5st unit	52	58	64	70	76	92	98	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276	292	298	304
6st unit	36	42	48	54	60	76	82	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288
7st unit	20	26	32	38	44	60	66	72	78	84	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272
8st unit	4	10	16	22	28	44	50	56	62	68	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256

APPENDIX B

Complete Instructions Set

Instructions

General

This is an experiment in the economics of market decision making. Various research foundations have provided funds for this research. The instructions are simple and if you follow them carefully and make good decisions you might earn a considerable amount of money which will be paid to you in cash.

We are going to conduct a market in which some of you will be buyers and some of you will be sellers in a sequence of market days or trading periods. In this packet you will find a sheet, labeled either *Record of Purchases and Earnings* or *Record of Sales and Profits*, which describes the value to you of any decisions you might make. *You are **not** to reveal this information to anyone*. It is your own private information.

The type of currency used in this market is francs. All trading and earnings will be in terms of francs. Each franc is worth _____ dollars to you. *Do **not** reveal this number to anyone*. At the end of the experiment your francs will be converted to dollars at this rate, and you will be paid in dollars. Note that the more francs you earn, the more dollars you earn.

Specific Instructions to the Buyers

During each market period you are free to purchase as many units as you might want. The profit from each purchase (which is yours to keep) is computed by taking the difference between the redemption value and purchase price of the unit bought. Note that you *may* buy a unit for a price which exceeds the redemption value. Therefore,

[your profit = (redemption value) - (purchase price)]

Your redemption value depends upon **your volume** and the **volume of others**. This means that when you buy units you will not know your redemption values with certainty. Your redemption values will be known only at the end of a period when the total volume of purchases is known. Examine your *Redemption Sheet*. If the **volume of others** is zero, that is, you were the only one who bought units, then the redemption value of each of your units is found in the column labeled **0**. If the **volume of others** is 23 then the redemption value of each of your units is found in the column labeled **23**.

Suppose, for example, that you bought two units in a market in which a total of ten units were bought. Find the appropriate column in your *Example Redemption Sheet* (as illustrated on the chalkboard). Since the **volume of others** is 8 units, the redemption value for you of the 1st unit is 6000 and the redemption value of the 2nd unit is 4500. If you bought each unit for 3500, your profit is:

profit from 1st unit = 6000 - 3500 = 2500
profit from 2nd unit = 4500 - 3500 = 1000

total profit = 2500 + 1000 = 3500

The blanks on the *Record of Purchases and Earnings* will help you record your profit. The purchase price of the 1st unit you buy during the first period should be recorded in row (2). Do the same (in the appropriate rows) for any additional units bought in this period. At the end of the period, enter the **market volume** of the period in row (A), enter **your volume** in row (B) and subtract row (B) from row (A) to determine the resulting **volume of others** to enter in row (C). Then look on your *Redemption Sheet* to find your unit redemption values. On the *Record of Purchases and Earnings Sheet* enter the redemption value of the 1st unit in row (1). You should then record the profit on this sale as directed in row (3). After computing the profit for each unit bought, record the total profit for that period in the last row on the page, row (41). Subsequent periods should be recorded similarly in the appropriate column (period 1 in column (1); period 2 in column (2); etc.).

Specific Instructions to the Sellers

During each market period you are free to sell as many units as you might want. For the first unit that you sell *during a trading period* you will pay the amount listed in row (2) marked **Cost of 1st unit;** if you sell a second unit *during the same trading period* you will pay an additional amount listed in row (6) marked **Cost of 2nd unit;** etc. The profit from each sale (which is yours to keep) is computed by taking the difference between the price at which you sold the unit and the cost of the unit. *Note that you may sell a unit at a price below the cost of the unit.* Therefore,

[your profit = (sale price) - (cost)].

Suppose, for example, that you sold two units and that your cost for the 1st unit is 1500 and the cost for the 2nd unit is 2000. If you sold each unit for 3500, your profit is:

profit from 1st unit = 3500 - 1500 = 2000
profit from 2nd unit = 3500 - 2000 = 1500

total profit = 2000 + 1500 = 3500

The blanks on the *Record of Sales and Profits* will help you record your profit. The sale price of the 1st unit you sell during the first period should be recorded in row (1). You should then record the profit on this purchase as directed in row (3). Do the same (in the appropriate rows) for any additional units sold in this period. At the end of the period record the total profit in the last row on the page, row (11). Subsequent periods should be recorded similarly in the appropriate column (period 1 in column (1); period 2 in column (2); etc.).

Final Observations

1. Trading period 0 will be a trial period to familiarize you with the procedure and will not count toward your cash earnings.

2. Each individual has a large folder. All papers, instructions, records, etc. should be put into this folder. Leave the folder with us before leaving. *Take **nothing** home with you.*

3. We are able to advise you a little on making money. First, you should remember that pennies add up. Over many trades and a long period of time very small amounts earned on individual trades can add up to a great deal of money. Secondly, you should not expect your earnings to be steady. You will have some good periods and some bad periods. During bad times try not to become frustrated. Just stay in there and keep trying to earn what you can. It all adds up in the end.

4. Under no circumstances may you mention anything about activities which might involve you and other participants after the experiment (i.e., no physical threats, deals to split up afterwards, or leading questions).

5. Each individual will be paid in private. Your earnings are strictly your own business.

Example (Sellers)

Record of Sales and Profits, Seller No._____

Unit Sold	Trading Period Number		1	2	3	4	5	6	7	8	9	10	11
1	1	Selling price											
	2	Cost of 1st unit	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	
	3	Profit (row 1 - row 2)											
2	4	Selling price											
	5	Cost of 2nd unit	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
	6	Profit (row 4 - row 5)											
3	7	Selling price											
	8	Cost of 3rd unit	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	
	9	Profit (row 7 - row 8)											
4	10	Selling price											
	11	Cost of 4th unit	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	
	12	Profit (row 10 - row 11)											
5	13	Selling price											
	14	Cost of 5th unit	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	
	15	Profit (row 13 - row 14)											
6	16	Selling price											
	17	Cost of 6th unit	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	
	18	Profit (row 16 - row 17)											
7	19	Selling price											
	20	Cost of 7th unit	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	
	21	Profit (row 19 - row 20)											
8	22	Selling price											
	23	Cost of 8th unit	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	
	24	Profit (row 22 - row 23)											
9	25	Selling price											
	26	Cost of 9th unit	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	
	27	Profit (row 25 - row 26)											
	28	Selling price											

Example (Sellers)

1. If, in period 1, you sold two units for 1800 each, what would be your profit for the period _____? Complete the form.

2. If, in period 2, you sold one unit for 1000 what would be your profit for the period _____?

Example (Buyers)

Redemption Sheet

Buyer # ___

	Volume of Others																								
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1st unit	4200	4400	4600	4800	5000	5400	5600	5800	6000	6200	6400	6600	6800	6900	7000										
2nd unit	3700	3800	3900	4000	4100	4200	4300	4400	4500	4700	4800	5000	5300	5600	5800										
3rd unit	2700	2800	2900	3000	3100	3200	3300	3400	3500	3700	3900	4100	4300	4500	4700										
4th unit	2200	2300	2400	2500	2600	2700	2800	2900	3000	3200	3400	3600	3800	4000	4200										
5th unit	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2800	2900	3100	3500	3600										
6th unit	1200	1300	1400	1500	1600	1700	1800	1900	2000	2300	2400	2500	2800	2900	3000										
7th unit	700	800	900	1000	1100	1200	1300	1400	1500	1700	1900	2100	2200	2300	2400										
8th unit	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600										

Record of Purchases and Earnings, Buyer No.___

Unit Sold		Trading Period Number	1	2	3	4	5	6	7	8	9	10	11	12
	A	Market valuation												
	B	Own valuation												
	C	Valuation of others (row A - row B)												
1	1	1st unit redemption value												
	2	Purchase price												
	3	Profit (row 1 - row 2)												
2	4	2nd unit redemption value												
	5	Purchase price												
	6	Profit (row 4 - row 5)												
3	7	3rd unit redemption value												
	8	Purchase price												
	9	Profit (row 7 - row 8)												
4	10	4th unit redemption value												
	11	Purchase price												
	12	Profit (row 10 - row 11)												

Answer Using the Example

BUYER'S

1. If you bought one unit in a market in which six (6) units are purchased in total (your unit plus units purchased by others)
   a.) what is the volume of others _____ ?
   b.) what is the redemption value of your second unit _____ ?

2. If you bought two units in a market in which no other units are purchased
   a) what is the volume of others _____ ?
   b) what is the redemption value of your next unit _____ ?

Redemption Sheet

Buyer #__O__

	Volume of Others																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1st unit	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306	312	318	324	340	346	352	358	364	380	386
2st unit	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290	296	302	308	324	330	336	342	348	364	370
3st unit	92	108	114	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292	308	314	320	326	332	348	354
4st unit	76	92	98	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276	292	298	304	310	316	332	338
5st unit	60	76	82	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288	294	300	316	322
6st unit	44	60	66	72	78	84	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306
7st unit	28	44	50	56	62	68	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290
8st unit	12	28	34	40	46	52	68	74	80	86	92	108	114	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274

Redemption Sheet

Buyer #____1____

	Volume of Others																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1st unit	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288	294	300	316	322	328	334	340	356	362	368
2st unit	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306	312	318	324	340	346	352
3st unit	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290	296	302	308	324	330	336
4st unit	68	74	80	86	92	108	114	120	126	132	148	154	160	168	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292	308	314	320
5st unit	52	58	64	70	76	92	98	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276	292	298	304
6st unit	36	42	48	54	60	76	82	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288
7st unit	20	26	32	38	44	60	66	72	78	84	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272
8st unit	4	10	16	22	28	44	50	56	62	68	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256

Redemption Sheet

Buyer #___2___

	Volume of Others																															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1st unit	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306	312	318	324	340	346	352	358	364	380	386
2st unit	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290	296	302	308	324	330	336	342	348	364	370
3st unit	92	108	114	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292	308	314	320	326	332	348	354
4st unit	76	92	98	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276	292	298	304	310	316	332	338
5st unit	60	76	82	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288	294	300	316	322
6st unit	44	60	66	72	78	84	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306
7st unit	28	44	50	56	62	68	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290
8st unit	12	28	34	40	46	52	68	74	80	86	92	108	114	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274

Redemption Sheet

Buyer #__3__

	Volume of Others																															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1st unit	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292	308	314	320	326	332	348	354	360	366	372
2st unit	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276	292	298	304	310	316	332	338	344	350	356
3st unit	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288	294	300	316	322	328	334	340
4st unit	72	78	84	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306	312	318	324
5st unit	56	62	68	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290	296	302	308
6st unit	40	46	52	68	74	80	86	92	108	114	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292
7st unit	24	30	36	52	58	64	70	76	92	98	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276
8st unit	8	14	20	36	42	48	54	60	76	82	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260

Redemption Sheet

Buyer #__4__

	Volume of Others																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1st unit	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288	294	300	316	322	328	334	340	356	362	368
2st unit	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306	312	318	324	340	346	352
3st unit	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290	296	302	308	324	330	336
4st unit	68	74	80	86	92	108	114	120	126	132	148	154	160	168	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292	308	314	320
5st unit	52	58	64	70	76	92	98	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276	292	298	304
6st unit	36	42	48	54	60	76	82	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288
7st unit	20	26	32	38	44	60	66	72	78	84	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272
8st unit	4	10	16	22	28	44	50	56	62	68	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256

Redemption Sheet

Buyer #5

	Volume of Others																															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1st unit	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292	308	314	320	326	332	348	354	360	366	372
2st unit	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276	292	298	304	310	316	332	338	344	350	356
3st unit	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260	276	282	288	294	300	316	322	328	334	340
4st unit	72	78	84	100	106	112	118	124	140	146	152	158	164	180	186	192	198	204	220	226	232	238	244	260	266	272	278	284	300	306	312	318	324
5st unit	56	62	68	84	90	96	102	108	124	130	136	142	148	164	170	176	182	188	204	210	216	222	228	244	250	256	262	268	284	290	296	302	308
6st unit	40	46	52	68	74	80	86	92	108	114	120	126	132	148	154	160	166	172	188	194	200	206	212	228	234	240	246	252	268	274	280	286	292
7st unit	24	30	36	52	58	64	70	76	92	98	104	110	116	132	138	144	150	156	172	178	184	190	196	212	218	224	230	236	252	258	264	270	276
8st unit	8	14	20	36	42	48	54	60	76	82	88	94	100	116	122	128	134	140	156	162	168	174	180	196	202	208	214	220	236	242	248	254	260

Record of Sales and Profits, Seller No. 6

Unit Sold		Trading Period Number	0	1	2	3	4	5	6	7	8	9	10
	1	Selling price											
1	2	Cost of 1st unit	128	128	128	128	128	128	128	128	128	160	160
	3	Profit (row 1 - row 2)											
	4	Selling price											
2	5	Cost of 2nd unit	140	140	140	140	140	140	140	140	140	166	166
	6	Profit (row 4 - row 5)											
	7	Selling price											
3	8	Cost of 3rd unit	196	196	196	196	196	196	196	196	196	181	181
	9	Profit (row 7 - row 8)											
	10	Selling price											
4	11	Cost of 4th unit	236	236	236	236	236	236	236	236	236	200	200
	12	Profit (row 10 - row 11)											
	13	Selling price											
5	14	Cost of 5th unit	244	244	244	244	244	244	244	244	244	228	228
	15	Profit (row 13 - row 14)											
	16	Selling price											
6	17	Cost of 6th unit	250	250	250	250	250	250	250	250	250	252	252
	18	Profit (row 16 - row 17)											
	19	Selling price											
7	20	Cost of 7th unit	266	266	266	266	266	266	266	266	266	316	316
	21	Profit (row 19 - row 20)											
	22	Selling price											
8	23	Cost of 8th unit	284	284	284	284	284	284	284	284	284	388	388
	24	Profit (row 22 - row 23)											
	25	Selling price											
9	26	Cost of 9th unit	292	292	292	296	296	296	296	296	296	420	420
	27	Profit (row 25 - row 26)											
	28	Selling price											
10	29	Cost of 10th unit	298	298	298	298	298	298	298	298	298	444	444
	30	Profit (row 28 - row 29)											
	31	Total per period											

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Record of Sales and Profits, Seller No. 7

Unit Sold		Trading Period Number	0	1	2	3	4	5	6	7	8	9	10
	1	Selling price											
1	2	Cost of 1st unit	132	132	132	132	132	132	132	132	132	162	162
	3	Profit (row 1 - row 2)											
	4	Selling price											
2	5	Cost of 2nd unit	144	144	144	144	144	144	144	144	144	168	168
	6	Profit (row 4 - row 5)											
	7	Selling price											
3	8	Cost of 3rd unit	188	188	188	188	188	188	188	188	188	180	180
	9	Profit (row 7 - row 8)											
	10	Selling price											
4	11	Cost of 4th unit	234	234	234	234	234	234	234	234	234	195	195
	12	Profit (row 10 - row 11)											
	13	Selling price											
5	14	Cost of 5th unit	246	246	246	246	246	246	246	246	246	236	236
	15	Profit (row 13 - row 14)											
	16	Selling price											
6	17	Cost of 6th unit	252	252	252	252	252	252	252	252	252	260	260
	18	Profit (row 16 - row 17)											
	19	Selling price											
7	20	Cost of 7th unit	264	264	264	264	264	264	264	264	264	308	308
	21	Profit (row 19 - row 20)											
	22	Selling price											
8	23	Cost of 8th unit	282	282	282	282	282	282	282	282	282	380	380
	24	Profit (row 22 - row 23)											
	25	Selling price											
9	26	Cost of 9th unit	294	294	294	294	294	294	294	294	294	420	420
	27	Profit (row 25 - row 26)											
	28	Selling price											
10	29	Cost of 10th unit	300	300	300	300	300	300	300	300	300	452	452
	30	Profit (row 28 - row 29)											
	31	Total per period											

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Record of Sales and Profits, Seller No. 8

Unit Sold		Trading Period Number	0	1	2	3	4	5	6	7	8	9	10
	1	Selling price											
1	2	Cost of 1st unit	136	136	136	136	136	136	136	136	136	164	164
	3	Profit (row 1 - row 2)											
	4	Selling price											
2	5	Cost of 2nd unit	148	148	148	148	148	148	148	148	148	170	170
	6	Profit (row 4 - row 5)											
	7	Selling price											
3	8	Cost of 3rd unit	180	180	180	180	180	180	180	180	180	178	178
	9	Profit (row 7 - row 8)											
	10	Selling price											
4	11	Cost of 4th unit	232	232	232	232	232	232	232	232	232	191	191
	12	Profit (row 10 - row 11)											
	13	Selling price											
5	14	Cost of 5th unit	248	248	248	248	248	248	248	248	248	244	244
	15	Profit (row 13 - row 14)											
	16	Selling price											
6	17	Cost of 6th unit	254	254	254	254	254	254	254	254	254	268	268
	18	Profit (row 16 - row 17)											
	19	Selling price											
7	20	Cost of 7th unit	262	262	262	262	262	262	262	262	262	300	300
	21	Profit (row 19 - row 20)											
	22	Selling price											
8	23	Cost of 8th unit	280	280	280	280	280	280	280	280	280	372	372
	24	Profit (row 22 - row 23)											
	25	Selling price											
9	26	Cost of 9th unit	296	296	296	296	296	296	296	296	296	436	436
	27	Profit (row 25 - row 26)											
	28	Selling price											
10	29	Cost of 10th unit	302	302	302	302	302	302	302	302	302	460	460
	30	Profit (row 28 - row 29)											
	31	Total per period											

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Record of Sales and Profits, Seller No. 9

Unit Sold		Trading Period Number	0	1	2	3	4	5	6	7	8	9	10
	1	Selling price											
1	2	Cost of 1st unit	116	116	116	116	116	116	116	116	116	154	154
	3	Profit (row 1 - row 2)											
	4	Selling price											
2	5	Cost of 2nd unit	156	156	156	156	156	156	156	156	156	172	172
	6	Profit (row 4 - row 5)											
	7	Selling price											
3	8	Cost of 3rd unit	220	220	220	220	220	220	220	220	220	184	184
	9	Profit (row 7 - row 8)											
	10	Selling price											
4	11	Cost of 4th unit	230	230	230	230	230	230	230	230	230	188	188
	12	Profit (row 10 - row 11)											
	13	Selling price											
5	14	Cost of 5th unit	238	238	238	238	238	238	238	238	238	206	206
	15	Profit (row 13 - row 14)											
	16	Selling price											
6	17	Cost of 6th unit	256	256	256	256	256	256	256	256	256	276	276
	18	Profit (row 16 - row 17)											
	19	Selling price											
7	20	Cost of 7th unit	272	272	272	272	272	272	272	272	272	340	340
	21	Profit (row 19 - row 20)											
	22	Selling price											
8	23	Cost of 8th unit	278	278	278	278	278	278	278	278	278	364	364
	24	Profit (row 22 - row 23)											
	25	Selling price											
9	26	Cost of 9th unit	286	286	286	286	286	286	286	286	286	396	396
	27	Profit (row 25 - row 26)											
	28	Selling price											
10	29	Cost of 10th unit	304	304	304	304	304	304	304	304	304	468	468
	30	Profit (row 28 - row 29)											
	31	Total per period											

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Record of Sales and Profits, Seller No. 10

Unit Sold		Trading Period Number	0	1	2	3	4	5	6	7	8	9	10
	1	Selling price											
1	2	Cost of 1st unit	120	120	120	120	120	120	120	120	120	156	156
	3	Profit (row 1 - row 2)											
	4	Selling price											
2	5	Cost of 2nd unit	164	164	164	164	164	164	164	164	164	174	174
	6	Profit (row 4 - row 5)											
	7	Selling price											
3	8	Cost of 3rd unit	212	212	212	212	212	212	212	212	212	183	183
	9	Profit (row 7 - row 8)											
	10	Selling price											
4	11	Cost of 4th unit	228	228	228	228	228	228	228	228	228	186	186
	12	Profit (row 10 - row 11)											
	13	Selling price											
5	14	Cost of 5th unit	240	240	240	240	240	240	240	240	240	212	212
	15	Profit (row 13 - row 14)											
	16	Selling price											
6	17	Cost of 6th unit	258	258	258	258	258	258	258	258	258	284	284
	18	Profit (row 16 - row 17)											
	19	Selling price											
7	20	Cost of 7th unit	270	270	270	270	270	270	270	270	270	332	332
	21	Profit (row 19 - row 20)											
	22	Selling price											
8	23	Cost of 8th unit	276	276	276	276	276	276	276	276	276	356	356
	24	Profit (row 22 - row 23)											
	25	Selling price											
9	26	Cost of 9th unit	288	288	288	288	288	288	288	288	288	404	404
	27	Profit (row 25 - row 26)											
	28	Selling price											
10	29	Cost of 10th unit	306	306	306	306	306	306	306	306	306	476	476
	30	Profit (row 28 - row 29)											
	31	Total per period											

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Record of Sales and Profits, Seller No. 11

Unit Sold		Trading Period Number	0	1	2	3	4	5	6	7	8	9	10
	1	Selling price											
1	2	Cost of 1st unit	124	124	124	124	124	124	124	124	124	158	158
	3	Profit (row 1 - row 2)											
	4	Selling price											
2	5	Cost of 2nd unit	172	172	172	172	172	172	172	172	172	176	176
	6	Profit (row 4 - row 5)											
	7	Selling price											
3	8	Cost of 3rd unit	204	204	204	204	204	204	204	204	204	182	182
	9	Profit (row 7 - row 8)											
	10	Selling price											
4	11	Cost of 4th unit	226	226	226	226	226	226	226	226	226	185	185
	12	Profit (row 10 - row 11)											
	13	Selling price											
5	14	Cost of 5th unit	242	242	242	242	242	242	242	242	242	218	218
	15	Profit (row 13 - row 14)											
	16	Selling price											
6	17	Cost of 6th unit	260	260	260	260	260	260	260	260	260	292	292
	18	Profit (row 16 - row 17)											
	19	Selling price											
7	20	Cost of 7th unit	268	268	268	268	268	268	268	268	268	324	324
	21	Profit (row 19 - row 20)											
	22	Selling price											
8	23	Cost of 8th unit	274	274	274	274	274	274	274	274	274	348	348
	24	Profit (row 22 - row 23)											
	25	Selling price											
9	26	Cost of 9th unit	290	290	290	290	290	290	290	290	290	412	412
	27	Profit (row 25 - row 26)											
	28	Selling price											
10	29	Cost of 10th unit	308	308	308	308	308	308	308	308	308	484	484
	30	Profit (row 28 - row 29)											
	31	Total per period											

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Record of Sales and Profits, Seller No. 6

Unit Sold		Trading Period Number	11	12	13	14	15	16	17	18	19	20
1	1	Selling price										
	2	Cost of 1st unit	160	160	160	160	160	160	160	160	160	160
	3	Profit (row 1 - row 2)										
2	4	Selling price										
	5	Cost of 2nd unit	166	166	166	166	166	166	166	166	166	166
	6	Profit (row 4 - row 5)										
3	7	Selling price										
	8	Cost of 3rd unit	181	181	181	181	181	181	181	181	181	181
	9	Profit (row 7 - row 8)										
4	10	Selling price										
	11	Cost of 4th unit	200	200	200	200	200	200	200	200	200	200
	12	Profit (row 10 - row 11)										
5	13	Selling price										
	14	Cost of 5th unit	228	228	228	228	228	228	228	228	228	228
	15	Profit (row 13 - row 14)										
6	16	Selling price										
	17	Cost of 6th unit	252	252	252	252	252	252	252	252	252	252
	18	Profit (row 16 - row 17)										
7	19	Selling price										
	20	Cost of 7th unit	316	316	316	316	316	316	316	316	316	316
	21	Profit (row 19 - row 20)										
8	22	Selling price										
	23	Cost of 8th unit	388	388	388	388	388	388	388	388	388	388
	24	Profit (row 22 - row 23)										
9	25	Selling price										
	26	Cost of 9th unit	420	420	420	420	420	420	420	420	420	420
	27	Profit (row 25 - row 26)										
10	28	Selling price										
	29	Cost of 10th unit	444	444	444	444	444	444	444	444	444	444
	30	Profit (row 28 - row 29)										
	31	Total per period										

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Record of Sales and Profits, Seller No. 7

Unit Sold		Trading Period Number	11	12	13	14	15	16	17	18	19	20
1	1	Selling price										
	2	Cost of 1st unit	162	162	162	162	162	162	162	162	162	162
	3	Profit (row 1 - row 2)										
2	4	Selling price										
	5	Cost of 2nd unit	168	168	168	168	168	168	168	168	168	168
	6	Profit (row 4 - row 5)										
3	7	Selling price										
	8	Cost of 3rd unit	180	180	180	180	180	180	180	180	180	180
	9	Profit (row 7 - row 8)										
4	10	Selling price										
	11	Cost of 4th unit	195	195	195	195	195	195	195	195	195	195
	12	Profit (row 10 - row 11)										
5	13	Selling price										
	14	Cost of 5th unit	236	236	236	236	236	236	236	236	236	236
	15	Profit (row 13 - row 14)										
6	16	Selling price										
	17	Cost of 6th unit	260	260	260	260	260	260	260	260	260	260
	18	Profit (row 16 - row 17)										
7	19	Selling price										
	20	Cost of 7th unit	308	308	308	308	308	308	308	308	308	308
	21	Profit (row 19 - row 20)										
8	22	Selling price										
	23	Cost of 8th unit	380	380	380	380	380	380	380	380	380	380
	24	Profit (row 22 - row 23)										
9	25	Selling price										
	26	Cost of 9th unit	420	420	420	420	420	420	420	420	420	420
	27	Profit (row 25 - row 26)										
10	28	Selling price										
	29	Cost of 10th unit	452	452	452	452	452	452	452	452	452	452
	30	Profit (row 28 - row 29)										
	31	Total per period										

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Record of Sales and Profits, Seller No. 8

Unit Sold		Trading Period Number	11	12	13	14	15	16	17	18	19	20
	1	Selling price										
1	2	Cost of 1st unit	164	164	164	164	164	164	164	164	164	164
	3	Profit (row 1 - row 2)										
	4	Selling price										
2	5	Cost of 2nd unit	170	170	170	170	170	170	170	170	170	170
	6	Profit (row 4 - row 5)										
	7	Selling price										
3	8	Cost of 3rd unit	178	178	178	178	178	178	178	178	178	178
	9	Profit (row 7 - row 8)										
	10	Selling price										
4	11	Cost of 4th unit	191	191	191	191	191	191	191	191	191	191
	12	Profit (row 10 - row 11)										
	13	Selling price										
5	14	Cost of 5th unit	244	244	244	244	244	244	244	244	244	244
	15	Profit (row 13 - row 14)										
	16	Selling price										
6	17	Cost of 6th unit	268	268	268	268	268	268	268	268	268	268
	18	Profit (row 16 - row 17)										
	19	Selling price										
7	20	Cost of 7th unit	300	300	300	300	300	300	300	300	300	300
	21	Profit (row 19 - row 20)										
	22	Selling price										
8	23	Cost of 8th unit	372	372	372	372	372	372	372	372	372	372
	24	Profit (row 22 - row 23)										
	25	Selling price										
9	26	Cost of 9th unit	436	436	436	436	436	436	436	436	436	436
	27	Profit (row 25 - row 26)										
	28	Selling price										
10	29	Cost of 10th unit	460	460	460	460	460	460	460	460	460	460
	30	Profit (row 28 - row 29)										
	31	Total per period										

Name_____ Soc. Sec. No._____ Total Payment_____

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Unit Sold		Trading Period Number	11	12	13	14	15	16	17	18	19	20
	1	Selling price										
1	2	Cost of 1st unit	154	154	154	154	154	154	154	154	154	154
	3	Profit (row 1 - row 2)										
	4	Selling price										
2	5	Cost of 2nd unit	172	172	172	172	172	172	172	172	172	172
	6	Profit (row 4 - row 5)										
	7	Selling price										
3	8	Cost of 3rd unit	184	184	184	184	184	184	184	184	184	184
	9	Profit (row 7 - row 8)										
	10	Selling price										
4	11	Cost of 4th unit	188	188	188	188	188	188	188	188	188	188
	12	Profit (row 10 - row 11)										
	13	Selling price										
5	14	Cost of 5th unit	206	206	206	206	206	206	206	206	206	206
	15	Profit (row 13 - row 14)										
	16	Selling price										
6	17	Cost of 6th unit	276	276	276	276	276	276	276	276	276	276
	18	Profit (row 16 - row 17)										
	19	Selling price										
7	20	Cost of 7th unit	340	340	340	340	340	340	340	340	340	340
	21	Profit (row 19 - row 20)										
	22	Selling price										
8	23	Cost of 8th unit	364	364	364	364	364	364	364	364	364	364
	24	Profit (row 22 - row 23)										
	25	Selling price										
9	26	Cost of 9th unit	396	396	396	396	396	396	396	396	396	396
	27	Profit (row 25 - row 26)										
	28	Selling price										
10	29	Cost of 10th unit	468	468	468	468	468	468	468	468	468	468
	30	Profit (row 28 - row 29)										
	31	Total per period										

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Record of Sales and Profits, Seller No. 10

Unit Sold		Trading Period Number	11	12	13	14	15	16	17	18	19	20
1	1	Selling price										
	2	Cost of 1st unit	156	156	156	156	156	156	156	156	156	156
	3	Profit (row 1 - row 2)										
2	4	Selling price										
	5	Cost of 2nd unit	174	174	174	174	174	174	174	174	174	174
	6	Profit (row 4 - row 5)										
3	7	Selling price										
	8	Cost of 3rd unit	183	183	183	183	183	183	183	183	183	183
	9	Profit (row 7 - row 8)										
4	10	Selling price										
	11	Cost of 4th unit	186	186	186	186	186	186	186	186	186	186
	12	Profit (row 10 - row 11)										
5	13	Selling price										
	14	Cost of 5th unit	212	212	212	212	212	212	212	212	212	212
	15	Profit (row 13 - row 14)										
6	16	Selling price										
	17	Cost of 6th unit	284	284	284	284	284	284	284	284	284	284
	18	Profit (row 16 - row 17)										
7	19	Selling price										
	20	Cost of 7th unit	332	332	332	332	332	332	332	332	332	332
	21	Profit (row 19 - row 20)										
8	22	Selling price										
	23	Cost of 8th unit	356	356	356	356	356	356	356	356	356	356
	24	Profit (row 22 - row 23)										
9	25	Selling price										
	26	Cost of 9th unit	404	404	404	404	404	404	404	404	404	404
	27	Profit (row 25 - row 26)										
10	28	Selling price										
	29	Cost of 10th unit	476	476	476	476	476	476	476	476	476	476
	30	Profit (row 28 - row 29)										
	31	Total per period										

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Record of Sales and Profits, Seller No. 11

Unit Sold		Trading Period Number	11	12	13	14	15	16	17	18	19	20
1	1	Selling price										
	2	Cost of 1st unit	158	158	158	158	158	158	158	158	158	158
	3	Profit (row 1 - row 2)										
2	4	Selling price										
	5	Cost of 2nd unit	176	176	176	176	176	176	176	176	176	176
	6	Profit (row 4 - row 5)										
3	7	Selling price										
	8	Cost of 3rd unit	182	182	182	182	182	182	182	182	182	182
	9	Profit (row 7 - row 8)										
4	10	Selling price										
	11	Cost of 4th unit	185	185	185	185	185	185	185	185	185	185
	12	Profit (row 10 - row 11)										
5	13	Selling price										
	14	Cost of 5th unit	218	218	218	218	218	218	218	218	218	218
	15	Profit (row 13 - row 14)										
6	16	Selling price										
	17	Cost of 6th unit	292	292	292	292	292	292	292	292	292	292
	18	Profit (row 16 - row 17)										
7	19	Selling price										
	20	Cost of 7th unit	324	324	324	324	324	324	324	324	324	324
	21	Profit (row 19 - row 20)										
8	22	Selling price										
	23	Cost of 8th unit	348	348	348	348	348	348	348	348	348	348
	24	Profit (row 22 - row 23)										
9	25	Selling price										
	26	Cost of 9th unit	412	412	412	412	412	412	412	412	412	412
	27	Profit (row 25 - row 26)										
10	28	Selling price										
	29	Cost of 10th unit	484	484	484	484	484	484	484	484	484	484
	30	Profit (row 28 - row 29)										
	31	Total per period										

Name_____ Soc. Sec. No._____ Total Payment_____

Address_____

Record of Purchases and Earnings, Buyer No.____

Unit Bought		Trading Period Number	11	12	13	14	15	16	17	18	19	20	
	A	Market volume											
	B	Own volume											
	C	Volume of others (row A - row B)											
1	1	1st unit redemption value											
	2	Purchase price											
	3	Profit (row 1 - row 2)											
2	4	2nd unit redemption value											
	5	Purchase price											
	6	Profit (row 4 - row 5)											
3	7	3rd unit redemption value											
	8	Purchase price											
	9	Profit (row 7 - row 8)											
4	10	4th unit redemption value											
	11	Purchase price											
	12	Profit (row 10 - row 11)											
5	13	5th unit redemption value											
	14	Purchase price											
	15	Profit (row 13 - row 14)											
6	16	6th unit redemption value											
	17	Purchase price											
	18	Profit (row 16 - row 17)											
7	19	7th unit redemption value											
	20	Purchase price											
	21	Profit (row 19 - row 20)											
8	22	8th unit redemption value											
	23	Purchase price											
	24	Profit (row 22 - row 23)											
9	25	9th unit redemption value											
	26	Purchase price											
	27	Profit (row 25 - row 26)											
10	28	10th unit redemption value											
	29	Purchase price											
	30	Profit (row 28 - row 29)											
	31	Total per period											

Name _____ Soc. Sec. No. _____ Total Payment _____

Address _____

Record of Purchases and Earnings, Buyer No.____

Unit Bought		Trading Period Number	0	1	2	3	4	5	6	7	8	9	10
	A	Market volume											
	B	Own volume											
	C	Volume of others (row A - row B)											
1	1	1st unit redemption value											
	2	Purchase price											
	3	Profit (row 1 - row 2)											
2	4	2nd unit redemption value											
	5	Purchase price											
	6	Profit (row 4 - row 5)											
3	7	3rd unit redemption value											
	8	Purchase price											
	9	Profit (row 7 - row 8)											
4	10	4th unit redemption value											
	11	Purchase price											
	12	Profit (row 10 - row 11)											
5	13	5th unit redemption value											
	14	Purchase price											
	15	Profit (row 13 - row 14)											
6	16	6th unit redemption value											
	17	Purchase price											
	18	Profit (row 16 - row 17)											
7	19	7th unit redemption value											
	20	Purchase price											
	21	Profit (row 19 - row 20)											
8	22	8th unit redemption value											
	23	Purchase price											
	24	Profit (row 22 - row 23)											
9	25	9th unit redemption value											
	26	Purchase price											
	27	Profit (row 25 - row 26)											
10	28	10th unit redemption value											
	29	Purchase price											
	30	Profit (row 28 - row 29)											
	31	Total per period											

Name_____ Soc. Sec. No._____ Total Payment_____

Address_____